# Supplemental Online Content

Claypool AL, DiGennaro C, Russell WA, et al. Cost-effectiveness of increasing buprenorphine treatment initiation, duration, and capacity among individuals who use opioids. *JAMA Health Forum*. 2023;4(5):e231080. doi:10.1001/jamahealthforum.2023.1080

This supplemental material has been provided by the authors to give readers additional information about their work.

## eMethods 1: Overview of SOURCE model

SOURCE (1,2) tracks opioid misuse, including OUD involving prescription opioids and heroin. SOURCE models the three FDA-approved MOUDs: methadone, buprenorphine, and extended-release injectable naltrexone. Each medication varies in the average duration of treatment, treatment capacity, and treatment-seeking rate. In SOURCE, mortality is based on the type of opioid use, likelihood of fentanyl exposure associated with heroin use, probability of naloxone administration, treatment status, and remission status.

Dynamic feedback loops are a key feature of SOURCE and of the cost-effectiveness analysis as they capture the interactions between the supply of and demand for MOUD. These feedback loops affect transition rates in the model and include social influence factors, risk perception, capacity limits on treatment, and availability of prescription and illicit opioids. For instance, capacity limits on buprenorphine prescribers and other systemic barriers to prescribing reflect real-life limits of buprenorphine provision (3).

SOURCE includes additional time-dependent trends as inputs. For example, SOURCE reflects that fentanyl contamination in the heroin supply as well as the availability of naloxone, an opioid overdose reversal medication, have increased over time. These trends affect the risk of mortality in the event of an opioid-related overdose. SOURCE does not consider overdose deaths that are unrelated to intentional opioid use and does not specify the number of overdoses resulting from fentanyl contamination of non-opioid substances. SOURCE was calibrated to data (1999-2020), including target data from the National Survey on Drug Use and Health, the National Vital Statistics System, and IQVIA prescription data—see (1,2).

In SOURCE, buprenorphine reduced the hazard of overdose death while in treatment (2). Also, the average duration is linked to treatment success based on the assumption that the longer the treatment duration, the greater the probability of exiting treatment into remission rather than returning to OUD.

eFigure 1 presents the overview of SOURCE. Details about data inputs, assumptions, and validation are reported elsewhere (1,2).

## eMethods 2: Description of literature review process

For each intervention, the review included specific search terms and processes (eTable 1). Two researchers (AFZ, ZR) conducted a review of the titles and abstracts, completed a full-text review of the papers that met the search criteria, extracted results on effectiveness and costs for each intervention, and discussed their results with a third researcher (ALC).

After reviewing the titles of all initial search results, we reviewed 180 titles and abstracts, and 45 complete manuscripts (eTable 1). We aggregated the quantitative results for the effectiveness of interventions based on trials, retrospective data review, and modeling studies and presented them in tables to compare similar values (eTables 2-6). Title and abstract reviews were conducted in Rayyan systematic review software (4).

The values selected for the base-case effectiveness for each intervention are highlighted below.

Inclusion Criteria for the literature search included:

- Quantitative measures of policy- effectiveness or costs
- Treatment for opioid use disorder included in the study
- Clearly about opioid use disorder
- Contains buprenorphine prescribed for opioid use disorder (OUD)
- Intervention was the primary part of the intervention
- Includes ages ≥ 18
- Peer-reviewed journal article
- In English or translated to English

## eMethods 3: Calculating final values for intervention effectiveness and costs

***Intervention effectiveness***

We selected the final values for the effectiveness of interventions based on whether we could implement these findings into the variables of SOURCE and the robustness of methods for estimating the effectiveness of interventions before and after implementation. For example, Fairley et al. (5) conducted a meta-analysis to calculate the hazard rate ratios of contingency management (HR=0.594) and psychotherapy (HR=0.986) and included annual costs (5). For the hub and spoke model, we used the Vermont hub and spoke results for our effectiveness measures because they studied the change in the number of prescribers and the number of patients per prescriber before and after program implementation (6). To model the effectiveness of ED initiated buprenorphine, we considered the percent of people who were still enrolled in buprenorphine after 30 days in four studies (7–10) and compared those to the control 30-day treatment retention in D'Onofrio to calculate a mean, minimum, and maximum treatment-seeking ratio of ED initiation (1.556 [1.164, 2.108]). ED initiation effectiveness was applied to the number of people in the ED, which we estimated as the percent of people per year with OUD involving prescription opioids and/or heroin (with a model-estimated probability of exposure to fentanyl) who would experience a non-fatal opioid overdose. This was estimated to be 26% in the SOURCE model run of the status quo.

The total number of people to receive the ED initiation intervention at time *t* is modeled as:

$$N_{ED}^{t} = c(P(nfod|OUD)N_{OUD} + P(nfod|HUD)N_{HUD})$$

$N_{ED}^{t}$ = *number of people who receive ED-initiated buprenorphine at time t*

$c = coverage\ rate\ of\ intervention\ in\ ED$

$P(nfod|OUD) =\ yearly\ probability\ of\ nonfatal\ overdose\ given\ OUD$

$P(nfod|HUD) =\ yearly\ probability\ of\ nonfatal\ overdose\ given\ HUD$

$N_{OUD} = Population\ of\ people\ with\ OUD\ in\ SOURCE$

$N_{HUD} = Population\ of\ people\ with\ HUD\ in\ SOURCE$

Increase in average duration of buprenorphine prescribing while in telehealth was calculated using the average duration with and without telehealth in the Vakkalanka study.

***Intervention costs***

Annual costs for contingency management services and psychotherapy were derived in Fairley, et al. (5). We calculated the cost of buprenorphine per provider ($31,593, 2017 USD), by dividing the Washington-state hub and spoke program maximum annual contract per network ($789,825, 2017 USD) by the average number of providers per network (n=25) and adjusting for inflation (12). For ED initiation, we summed the screening cost ($214, 2017 USD) and intervention costs ($83, 2017 USD) from Busch et al. 2017 (13) plus a cost of additional counseling services (14) ($225, 2020 USD), meant to represent a bridge program from buprenorphine in the ED to linkage with a longer-term provider. We did not find the cost of telehealth for buprenorphine prescribing. However, for all results of cost of telehealth for other types of appointments, the cost of a telehealth appointment was less than for in-person appointment (eTable 7). Therefore, we assume the cost of telehealth is $0 compared to in-person appointments. We did not consider fixed technology installment costs, which is consistent with other cost-effectiveness analyses (15). Additional, initial costs for scale-up of interventions were not included. All costs were adjusted to 2021 U.S. Dollars using the Consumer Price Index.

## eMethods 4: Methods for calculating expected end-of-life QALYs

For opioid overdose deaths, we calculated the estimated lifetime QALY lost by applying age-specific mean quality of life values estimated in Sullivan and Ghushchyan 2006 (16) to the expected remaining life years based on the age-specific annual probability of death according to CDC life tables. We discounted future QALYs at 3% annually. The age-weighted average of end-of-life QALYs was calculated using the estimated age-stratified population of people with OUD in the United States (17).

## eMethods 5: Methods for calculating healthcare costs of opioid use disorder

***Background healthcare costs***

We used average baseline healthcare cost estimates from Medical Expenditure Panel Survey (MEPS) (18) The excess healthcare cost of the population with OUD is obtained from (19) separately for the treated and untreated subpopulations and without including the treatment cost of OUD. We conservatively assumed that patients with OUD who are receiving treatment have 20% higher costs on average than those not receiving treatment, which also aligns with other studies in the literature (5,19,20).

***Cost of non-fatal and fatal opioid overdose***

Opioid overdose cost consists of the expected costs of calling Emergency Medical Services (EMS) to transport to a hospital, ED visit, and hospital stays. We assumed that 90% of the opioid overdose cases are transported to the hospital by EMS (21), and the costs of calling EMS and transport to the hospital were obtained from (21–23). We estimate that 73% of non-fatal opioid overdoses are discharged from ED versus the remaining are discharged after inpatient stays (21). Whereas 1.4% of fatal opioid overdoses are observed in ED and 6.2% during an inpatient stay

(24). Varying levels (low, medium, high) of cost estimates for ED (21,22,25) inpatient stay (21,22,24) and EMS (21–23) are obtained from the literature.

***MOUD costs***
Methadone treatment: Treatment cost includes the cost of methadone and associated drug administration cost. We assumed that methadone is administered daily for patients' treatment programs.

Buprenorphine treatment: Treatment cost includes the cost of buprenorphine, drug monitoring, and counseling services. We assumed that the patient would receive medication counseling twice a week.

Naltrexone treatment: Treatment cost includes the cost of injectable naltrexone, administration, and related services (e.g., drug monitoring, counseling services, etc.). We assumed that the patient would administer naltrexone and receive medication counseling services once per month.

## eMethods 6: Methods for calculating productivity and consumption costs

***Expected remaining life years lost due to overdose***
Following the recommendations of the Second Panel on Cost-Effectiveness in Health and Medicine (26) we included the loss of future productivity minus their future consumption as their net productivity loss for each overdose death. We first calculated the age-specific expected remaining life years lost using CDC life tables (27)

***Productivity***
We used the mean income by age group as estimated in the U.S. Census Bureau, Current Population Survey, 2020 Annual Social and Economic Supplement (CPS ASEC) (28).

***Consumption***
We used the age group-specific mean expenditure per person as estimated in the Consumer Expenditure Survey, U.S. Bureau of Labor Statistics from September 2020 (29) To calculate the net present value, we calculated net productivity (productivity minus consumption) for each year, multiplied by the probability an individual would have lived to that year from the life tables and discounted all future values by 3%.

***Age-weighted average***
Age-weighted averages for consumption and productivity were calculated using the estimated age-stratified population of people with OUD in the United States (17) and adjusted for inflation to reflect 2021 USD using the Consumer Price Index. We assumed productivity and consumption costs were equal for individuals experiencing OUD and those not experiencing OUD, similar to Appendix A in the Second Panel on Cost-Effectiveness in Health and Medicine (30).

## eMethods 7: Sensitivity analysis process

We conducted a probabilistic sensitivity analysis of intervention effectiveness by running 1,000 simulations for each intervention or combination of interventions using effectiveness

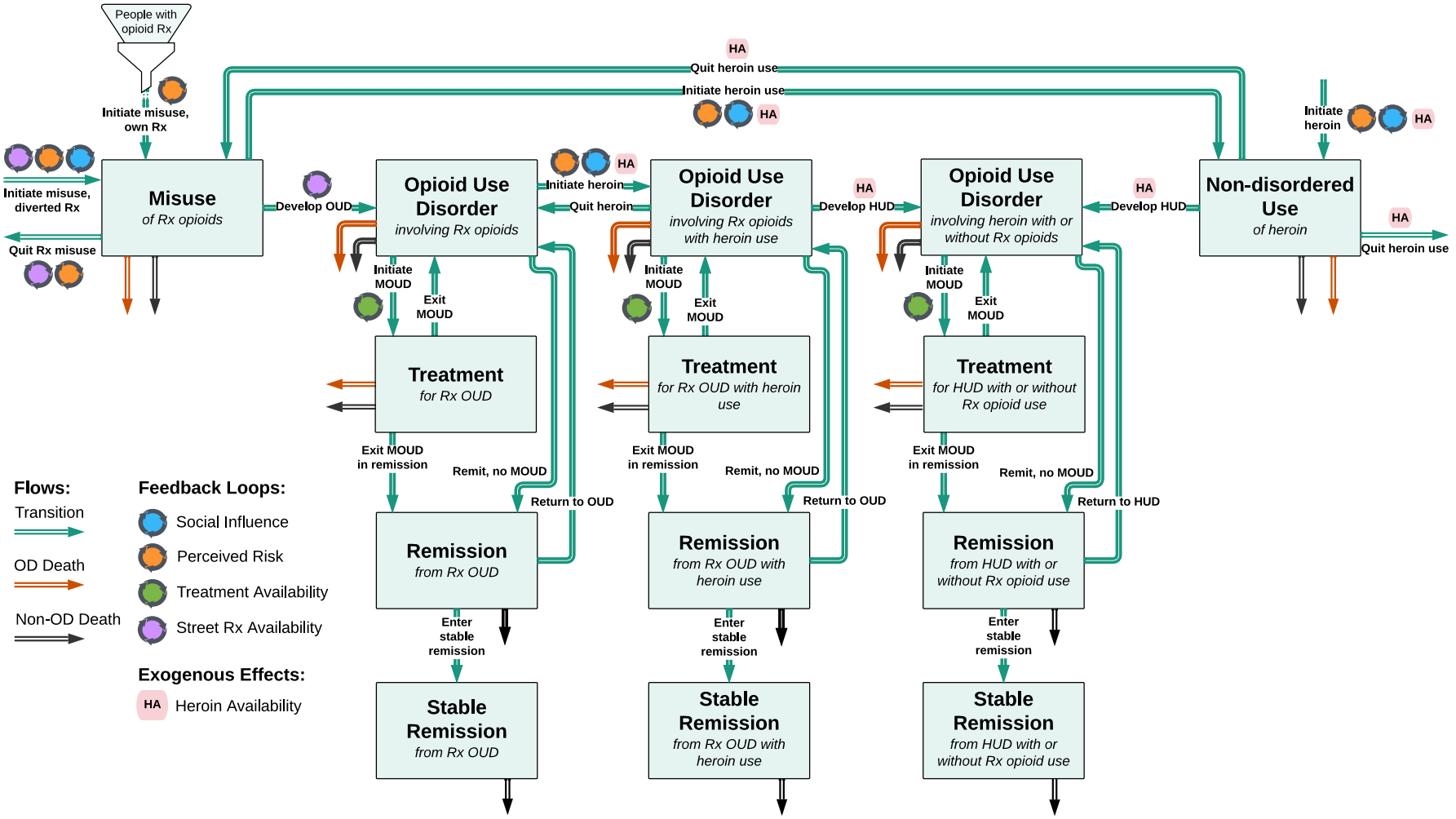
parameters and intervention and treatment costs, sampled from uniform distributions over the uncertainty ranges, when available (Table 1, eTable 8). For input and treatment costs, we assumed a range that was 25% above and below each basecase value.

We calculated the net monetary benefit (NMB) for each run for intervention to consider if they were considered cost-effective compared to the status quo (NMB > 0).

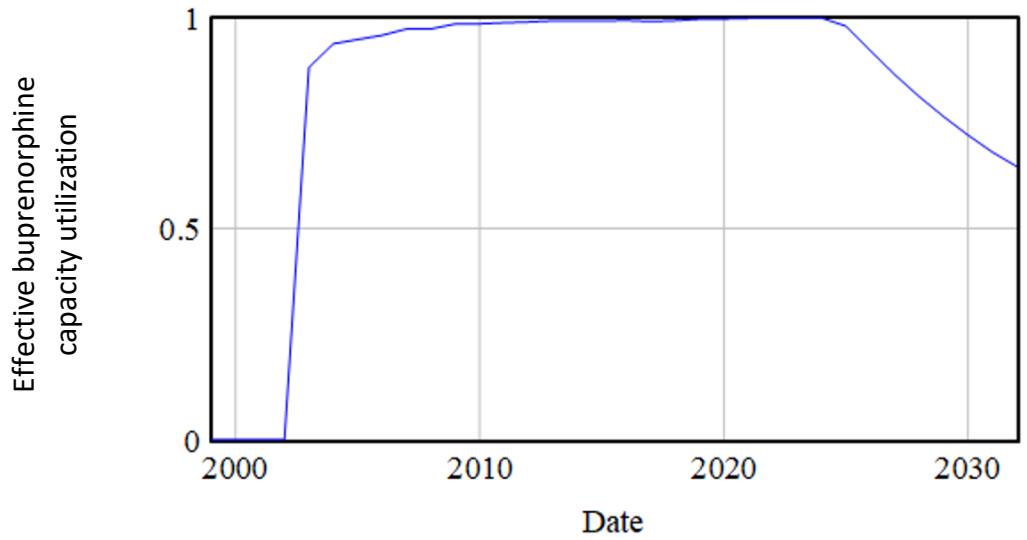
$$NMB = Incremental\ QALYs\ \times WTP - Incremental\ Costs$$

We then reviewed the percent of runs in which each intervention or combination of interventions was considered cost-effective compared with the status quo of no additional interventions as well as the percent of runs in which each intervention was the preferred intervention (NMB the highest for the intervention compared all other interventions for that simulation run).

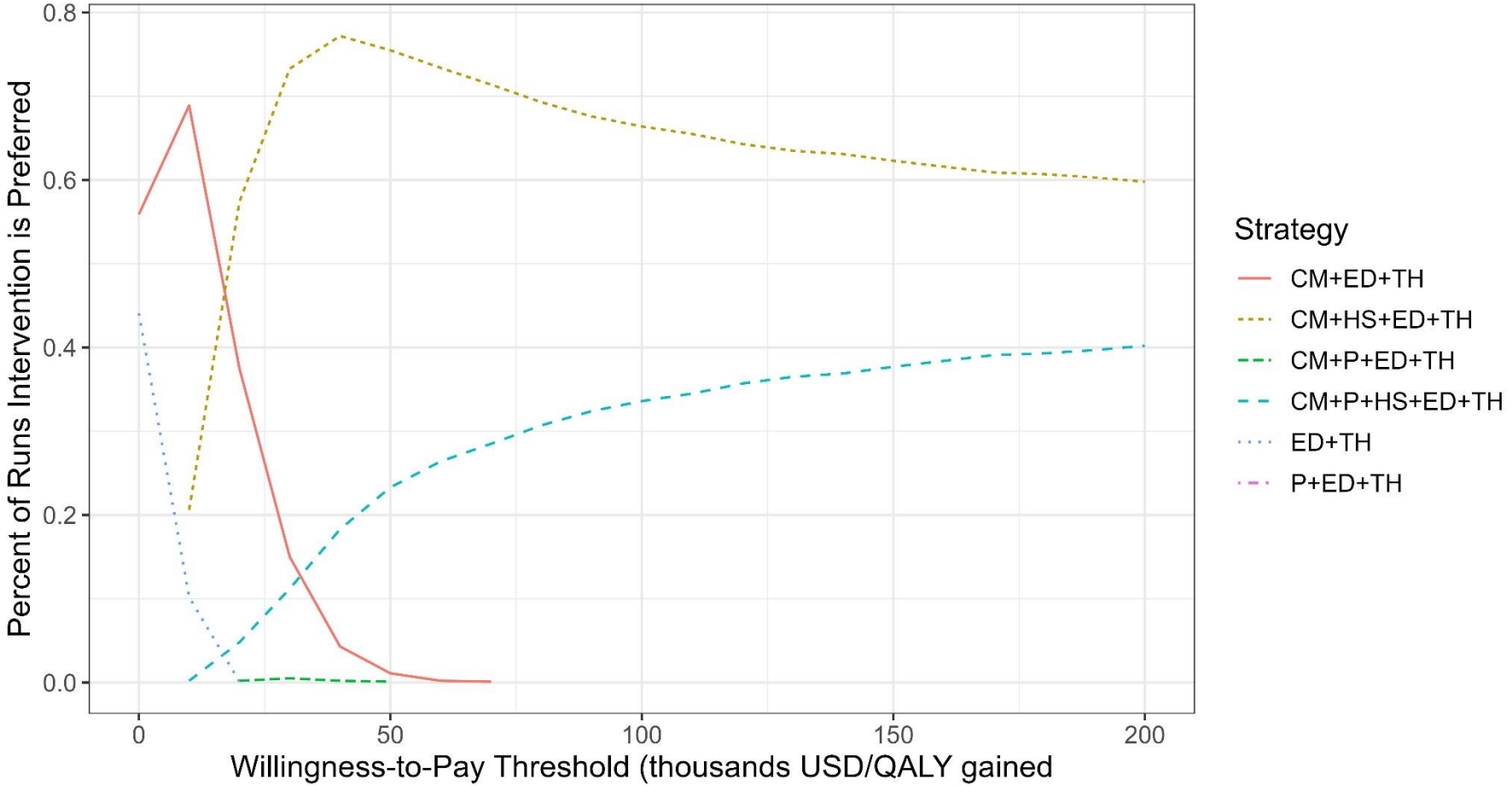
# Supplemental figures




**eFigure 1**: SOURCE's structure (2)




**eFigure 2**: Buprenorphine effective capacity utilization over time in the status quo
Effective capacity reflects the number of buprenorphine providers and the average number of patients that each provider sees. Effective capacity reflects the impacts of provider-side barriers on their willingness and ability to prescribe buprenorphine. This may include regulatory, logistical, and stigmatic barriers.




**eFigure 3**: Cost-Effectiveness Acceptability Curve

Each line represents a single strategy of the sensitivity analysis in which intervention effectiveness parameter(s). Out of the 1000 Probabilistic Sensitivity Analysis (PSA) runs, it shows the percent of runs where each strategy was the preferred strategy, for willingness to pay thresholds from $0-$200,000/ QALY gained. Strategies that were never preferred are excluded.

# Supplemental tables

**eTable 1**: Literature search systematic approach

| Topic | Dates of Search* | Search Terms Used (All) | Number of Search Results | Number of Titles and Abstracts Revised | Number of Full Papers Read | Final Number of Papers Included [o] |
|---|---|---|---|---|---|---|
| Contingency Management | 5/1/21 – 7/1/21 | contingency management in methadone clinics; opioid use disorder contingency management; prize reinforcement opioid use; contingency management in opioid clinics; contingency management for opioids | 749 | 38 | 11 | 2 |
| Psychotherapy and Counseling | 7/6/21 – 12/1/21 | psychotherapy medications for opioid use disorder, psychotherapy opioid use, counseling opioid use disorder, counseling buprenorphine/methadone/naltrexone, therapy and opioid use disorder, maintenance therapy, - opioid maintenance+ group/clinic therapy | 63 | 42 | 9 | 7 |
| Hub and Spoke, Provider Training | 5/19/21 – 7/1/21 | opioid use disorder, training, capacity, treatment, buprenorphine, MOUD, OUD, medications, provider, physician, waiver, education, cost, cost-effectiveness, duration | 900 | 100 | 25 | 15 |
| ED initiated Buprenorphine | 11/10/21 – 4/1/22 | emergency department, ED, initiation, buprenorphine, opioid use, cost | 131 | 131 | 28 | 14 |
| Telehealth | 1/18/22 – 2/10/23 | telemedicine, telehealth, buprenorphine, opioid use disorder, cost | 185 | 125 | 41 | 15 |

*A combination of PubMed and Google Scholar was used. [o] Final papers limited to buprenorphine studies only.
MOUD=Medication for opioid use disorder; OUD=Opioid use disorder; ED=Emergency Department

**eTable 2**: Effectiveness, retention, duration, and costs of contingency management (CM) in MOUD treatment studies

| Source | Type of MOUD | Type of CM Studied | Number of Patients | | Duration of Study (Months) | Duration of CM (Months) | Average treatment retention (weeks) | | Percent of Negative Urine Samples | | Hazard Ratio of discontinuation | Average Cost of CM per treatment | Time Frame of Costs (Months) | Costs Included |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ST | CM | | | ST (sd) | CM (sd) | ST (sd) | CM (sd) | | | | |
| Fairley et al. (5) | Methadone, buprenorphine, or XR-naltrexone | Prize based & Voucher Based | - | - | - | 12 | - | - | - | - | 0.594 (0.437-0.787) | $3385 (3055-3732) | 12 | VA data of cost of CM per patient in treatment |
| Ling et al. (31) | Buprenorphine | Prize based | 51 | 49 | 4.5 | 4 | 14.6 (5.1) | 14.6 (5.3) | 10.86 (10.7) | 14.04 (12.3) | - | $230-$1460 | 4 | Costs of prizes |

ST=Standard Treatment, CM=Contingency Management, VA=U.S. Department of Veterans Affairs

**eTable 3**: Effectiveness, retention, duration, and costs of psychotherapy and counseling methods in MOUD treatment studies

| Source | Type of MOUD | Duration of Study (Months) | Duration of Therapy (Months) | Type of Therapy Studied | Longest Duration of Abstinence (LDA) in weeks | | Average Duration (months) | | Mean Rate Negative Urine Samples | | Hazard Ratio of Discontinuation | Cost of Therapy per treatment (USD) | Time Frame of Costs (Months) | Costs Included |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Standard Medical Mngt | Enhanced Medical Mngt | Standard Medical Mngt | Enhanced Medical Mngt | Standard Medical Mngt | Enhanced Medical Mngt | | | | |
| Fiellin et al. 2006 (32) | Buprenorphine-naloxone | 6 | 6 | Standard medical management: (manual guided, medically focused counseling) Enhanced medical management: (manual guided, medically focused counseling extended) | 1.675 | 1.375 | 4.3 | 4.5 | 0.4 | 0.40 | - | - | - | - |
| Fairley et al. 2021 (5) | Methadone, buprenorphine, or XR-naltrexone | - | 12 | - | - | - | - | - | - | - | 0.986 (0.772-1.240) | 4295 (range 3877-4736) | 12 | Psychotherapy, 2019 USD, annual treatment cost |
| Polsky et al. 2010 (33) | Buprenorphine | 15 | 3 | Twice weekly drug counseling | - | - | - | - | - | - | - | Individual counseling: 27 Group: 9 Family: 30 | 12 | Cost of counseling |
| Tacke et 2009 al. (34) | Buprenorphine-naloxone | 1 | 1 | Weekly visits for supervised drug administration and counseling. | - | - | - | - | - | - | | 4502 | 1 | Cost of therapy + buprenorphine-naloxone, travel costs to clinic, price of Pharma DDS-I package, packaging costs |

**eTable 4**: Provider training

| Source | Population | Type of Intervention | # of additional waivered physicians | # of additional waivered NPs/PAs | # of additional patients treated | # of patients per physician | % providing/prepared to provide buprenorphine treatment |
|---|---|---|---|---|---|---|---|
| Brooklyn et al., 2017 (6) | Vermont OUD providers/patients | In-person: Hub and Spoke | 110 (64% increase) | | 1900 (211% increase) | 50% increase | |
| Winstanley et al., 2020 (35) | West Virginia OUD providers/patients | In-person: Hub and Spoke | 56 | | 196 | | |
| Levin et al., 2016 (36) | U.S. physicians participating in the program | Online: Providers' Clinical Support System for Medication Assisted Treatment (PCSS-MAT) | 4130 | | | | |
| Komaromy et al., 2016 (37) | New Mexico primary care providers | Online: Project ECHO | 275 | | | | |
| Auty et al., 2020 (38) | U.S. physicians, Nurse Practitioners, and Physician Assistants | Waiver training | | 28,010 | | | |
| Tong et al., 2018 (39) | Certified family doctors who graduated residency in 2013 | Training during residency | | | | | 10% prepared to provide buprenorphine treatment, 7% current providing buprenorphine treatment |
| Wen et al., 2018 (40) | Medicaid prescriptions | Waiver training | | | | | 10% increase in buprenorphine prescribing rate associated with 10% increase in waivered physicians |
| Foster et al., 2020 (41) | 3 EDs in Philadelphia | In-person | Increased from 6% to 90% | | | | Prescribing rate of <1% increased to 15% |
| Stokes et al., 2021 (42) | National Modeling study to find the theoretical maximum prescribers that could be added | In-person, medical school waiver training | | | 532,890 per year | | |

**eTable 5**: Emergency department initiation of buprenorphine

| **Source** | **Intervention** | **Study Type** | **Treatment after 30 days (intervention)** | **Treatment after 30 days (control)** |
|---|---|---|---|---|
| D'Onofrio et al. (2015) (7) | ED initiation | RCT | 78%<br>[70%-85%] | 37%<br>[28%-47%] |
| Jennings et al. (2021) (8) | ED initiation | Retrospective review | 43.1% | |
| Kaucher et al. (2020) (9) | ED initiation | Retrospective review | 49.3% | |
| Bogan et al. (2020) (10) | ED initiation | Prospective study | 59.9% | |
| | | **Average:** | **57.6%** | |

Average relative rate of treatment seeking = 57.56/37.0

Minimum relative rate of treatment seeking = 43.1/37.0

Maximum relative rate of treatment seeking = 78.0/37.0

**eTable 6**: Telemedicine for buprenorphine appointments

| Source | Number of Patients | | Duration of Study (months) | Average retention in treatment (days) | | Percent Retained in Treatment (%) | |
|---|---|---|---|---|---|---|---|
| | ST | TM | | ST | TM | ST | TM |
| Lin, Fortney, et al. 2022 (43) | 30,898 | 2,718 | 84 | 295 | 722 (322-1459) | - | - |
| Weintraub et al. 2021 (44) | 24 | 94 | 3 | - | - | 58.47 | 58.51 |
| Belcher et al. 2021 (45) | - | 7 | 3 | - | 21 | - | - |
| Weintraub et al. 2018 (46) | - | 177 | 3 | - | - | - | 57.4 |
| Harris et al. 2022 (47) | 131 | 19 | 12 | | | 82.4 | 68.4 |
| Tofighi et al. 2022 (48) | - | 78 | 3 | - | - | - | 53.8 |
| Rahman et al. 2021 (49) | - | 85 | 3 | - | - | - | 98.7 |
| Yeo et al. 2021 (50) | 166 | 111 | 6 | - | - | 91.5 | 51.9 |
| Ruetsch et al. 2012 (51) | 439 | 987 | 12 | - | - | 56.1 | 67.7 |
| Sahu et al. 2022 (52) | 487 | 811 | 24 | | | 61 | 49.3 |
| Vakkalanka et al. 2022 (53)* | 30270 | 593 | 120 | Discontinuation hazard rate ratio of telehealth= 0.66 (0.60, 0.78) | | | |
| Samuels et al. 2022 (54) | 0 | 159 | 4 | | | | 83.05% |
| Lin, Zhang, et al. 2022 (55) | 0 | 15,339 | 12 | 203.8 (pre-pandemic) | 208 days (pandemic) | | |
| Kaur et al. 2022 (56) | 0 | 56,000 | 12 | | | | Group 1: 92.55%, Group 2: 94.18%, Group 3: 90.83%, Group 4: 95% |
| Frost et al. 2022 (57) | 2,111 | 15,835 | 12 | | | 32.2% (post-COVID-19)<br>51.1% (pre-COVID-19) | 25.4% (post-COVID-19)<br>43.0% (pre-COVID-19) |

*Vakkalanka et al. was chosen as the source for telehealth effectiveness because it was a longitudinal study that considered the full duration of buprenorphine treatment when exposed to telehealth. Lin, Fortney, et al. 2022 was not used in the estimate because it was a descriptive results, and Lin, Zhang, et al. 2022 was not used because it evaluated the differences before and after March 2020 to study the differences in treatment during the pandemic. All other studies were not included because they only reported on percent retained in treatment over a certain time period, which could not produce an input for SOURCE.

**eTable 7**: Telemedicine costs for non-buprenorphine appointments

| Study | Type/field of study | Type of Costs | Cost of telemedicine appointment | Cost of in-person appointment | Cost of telehealth compared to in-person | Type and year of currency |
|---|---|---|---|---|---|---|
| Xu et al. 2008 (58) | ear, nose, and throat consultations | per consultation for telehealth | 108 | 155 | -47 | US (2019) |
| Armstrong et al. 2007 (59) | store-and-forward system for dermatology screening | hourly operating costs of care | 361 | 456 | -95 | US (2019) |
| Pare et al. 2006 (60) | monitoring for patients with chronic obstructive pulmonary disorder | total service cost per treatment | 8566 | 13713 | -5147 | US (2019) |
| Labiris et al. 2005 (61) | videoconference consultations mainly for orthopedics and dermatology | cost per consultation | 327 | 333 | -6 | US (2019) |
| Scuffham et al. 2002 (62) | dentist videoconference | per treatment | 233 | 662 | -429 | US (2019) |
| Bergmo et al. 2000 (63) | store-and-forward system for dermatology screening | per patient per year | 96042.79 | 179634.98 | -83592.19 | US (2019) |
| McCue et al. 1998 (64) | review of triage of specialists cases (HIV, cardiology, and oral surgery) | per visit | 430 | 835 | -405 | US (2019) |
| Frederix et al. 2016 (65) | monitoring for cardiovascular disease | per treatment | 2156 | 2720 | -564 | Euro (2015) |
| Greving et al. 2015 (66) | monitoring for vascular disease using patient-collected biometric information | per treatment | 4859 | 5078 | -219 | Euro (2009) |
| Nguyen et al. 2016 (67) | store-and-forward system for diabetic retinopathy screening | per treatment | 1914 | 2059 | -145 | Singapore $ (2015) |
| Thomas et al. 2015 (68) | store-and-forward ophthalmic images for glaucoma screening | per treatment | 872 | 4441 | -3569 | Canada $ (2014) |
| Zanaboni et al. 2013 (69) | monitoring of biometric data from an implanted device to identify heart failure exacerbations | per treatment | 291.36 | 381.34 | -89.98 | Euro (2010) |

**eTable 8**: Example model inputs and range for each intervention; 20% coverage level

| Intervention | Transition in Model (as seen in eFigure 1) | Parameter in model | Coverage level | Base case | Lower bound | Upper bound | Calculation of base case* | Source |
|---|---|---|---|---|---|---|---|---|
| ED Initiated Buprenorphine | Initiate MOUD (buprenorphine) for HUD | Buprenorphine treatment seeking rate - HUD | 20% of people with HUD that experience a non-fatal overdose[o] | 1.35 | 1.32 | 1.39 | 0.2*0.26*1.31*1.556+ (1-(0.2*0.26))*1.31 | (7–10) |
| | Initiate MOUD (buprenorphine) for OUD | Buprenorphine treatment seeking rate - OUD | 20% of people with OUD that experience a non-fatal overdose[o] | 0.317 | 0.311 | 0.326 | 0.2*0.26*0.308*1.556+ (1-(0.2*0.26))*0.308 | (7–10) |
| Contingency Management | Exit MOUD (buprenorphine) in remission or not in remission | Average duration of buprenorphine treatment (years) | 20% of buprenorphine patients | 0.693 | 0.64 | 0.77 | 0.8*0.61+0.2*(0.61/0.594) | (5) |
| Psychotherapy | Exit MOUD (buprenorphine) in remission or not in remission | Average duration of buprenorphine treatment (years) | 20% of buprenorphine patients | 0.612 | 0.59 | 0.65 | 0.8*0.61+0.2*(0.61/0.986) | (5) |
| Telehealth | Exit MOUD (buprenorphine) in remission or not in remission | Average duration of buprenorphine treatment (years) | 20% of buprenorphine patients | 0.66 | 0.60 | 0.78 | 0.8*0.61+0.2*(0.61/0.69) | (53) |
| Hub and Spoke | Initiate MOUD (based on treatment availability) | Total number of buprenorphine providers | 20% of buprenorphine prescribers | 12.8% increase | 5% increase | 20% increase | 0.64*0.2 | (6) |
| | Initiate MOUD (based on treatment availability) | Decay constant of buprenorphine provider capacity | 20% of buprenorphine prescribers | 4.005E-5 | 3.56E-5 | 4.2275E-5 | (1-(0.5*0.2))*4.45E-5 | (6) |
| Contingency Management + Psychotherapy | Exit MOUD (buprenorphine) in remission or not in remission | Average duration of buprenorphine treatment (years) | 20% of buprenorphine patients | 0.696 | 0.61 | 0.85 | 0.8*0.61+0.2*(0.61/(0.594*0.986)) | (5) |

*Average duration of buprenorphine for no intervention is 0.61 years. [o] Non-fatal overdose rate assumed to be 26% per year, according to SOURCE runs.

**eTable 9**: Sensitivity analysis - average incremental costs, QALYs gained, and net monetary benefit (NMB) by intervention compared to the status quo, 10% intervention coverage

| Strategy | Average Incremental QALYs compared to the Status Quo | Lower bound-Incremental QALYs | Upper bound-Incremental QALYs | Average Incremental Costs Compared to the Status Quo (USD 2021) | Lower bound-Incremental Costs (USD 2021) | Upper bound-Incremental Costs (USD 2021) | Average NMB Compared to the Status Quo* (USD 2021) | Lower bound-NMB* (USD 2021) | Upper bound-NMB* (USD 2021) | Percent of Runs that are Cost-Effective Compared to Status Quo* (%) | Percent of Runs where intervention is preferred* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CM | 171,567 | 79,652 | 294,566 | -403,839,522 | -17,142,295,270 | 16,317,013,785 | 17,560,570,124 | -7,501,984,726 | 43,842,875,707 | 96 | 0 |
| P | 3,062 | -61,230 | 85,772 | 2,308,023,380 | -14,029,419,429 | 18,949,943,082 | -2,001,853,309 | -23,306,433,326 | 21,808,958,566 | 41.7 | 0 |
| HS | 87,286 | 42,555 | 127,545 | 4,508,765,209 | -12,840,907,978 | 21,231,684,850 | 4,219,789,836 | -14,474,557,210 | 24,503,021,380 | 70.6 | 0 |
| ED | 101,301 | 26,831 | 176,253 | -618,242,668 | -17,975,608,225 | 16,027,360,840 | 10,748,345,316 | -11,049,763,848 | 34,955,040,418 | 88.8 | 0 |
| TH | 131,004 | 82,697 | 178,384 | -1,461,708,769 | -18,346,763,627 | 15,185,704,397 | 14,562,130,355 | -6,477,933,976 | 34,785,476,626 | 97.3 | 0 |
| CM+P | 173,276 | 29,282 | 325,535 | 1,641,046,919 | -15,440,818,417 | 18,555,811,817 | 15,686,552,202 | -10,185,176,455 | 44,802,953,673 | 92.5 | 0 |
| CM+ED | 261,114 | 109,583 | 424,731 | -1,204,484,013 | -17,597,102,011 | 15,594,614,234 | 27,315,879,535 | -2,298,064,327 | 58,511,027,091 | 99.7 | 0 |
| CM+ED+TH | 344,574 | 191,099 | 478,294 | -2,508,757,359 | -19,044,445,479 | 14,311,226,848 | 36,966,195,380 | 7,614,863,883 | 64,343,861,971 | 100 | 0 |
| CM+HS | 307,019 | 133,290 | 564,704 | 3,358,639,976 | -14,860,049,060 | 21,188,752,678 | 27,343,265,691 | -5,399,750,443 | 63,607,640,488 | 99.7 | 0 |
| CM+HS+ED | 410,714 | 181,451 | 733,779 | 2,426,340,849 | -15,586,152,760 | 20,394,129,850 | 38,645,092,314 | 155,639,251 | 78,998,936,044 | 100 | 0 |
| CM+HS+ED+TH | 543,127 | 265,792 | 873,427 | 658,732,298 | -17,392,843,570 | 18,206,199,693 | 53,653,933,768 | 12,422,202,057 | 91,041,740,492 | 100 | 66.4 |
| CM+P+HS | 310,443 | 85,093 | 645,638 | 5,393,724,194 | -13,156,790,371 | 23,443,221,708 | 25,650,574,275 | -6,034,476,753 | 61,155,840,816 | 97.9 | 0 |
| CM+P+ED | 262,675 | 69,032 | 436,089 | 844,972,467 | -16,066,493,268 | 17,711,945,899 | 25,422,562,179 | -5,275,003,610 | 57,612,555,632 | 99 | 0 |
| CM+P+HS+ED | 413,939 | 134,340 | 761,359 | 4,467,333,347 | -13,897,735,697 | 22,650,483,583 | 36,926,611,415 | -2,862,150,142 | 77,484,158,308 | 99.9 | 0 |
| CM+P+HS+TH | 448,086 | 186,862 | 776,353 | 3,591,367,309 | -14,518,104,455 | 21,221,096,935 | 41,217,259,647 | 8,435,370,789 | 81,006,296,690 | 100 | 0 |
| CM+P+TH | 264,722 | 112,203 | 382,875 | 274,978,884 | -16,355,680,781 | 17,091,219,042 | 26,197,200,940 | 873,368,500 | 50,454,321,018 | 100 | 0 |
| CM+P+ED+TH | 345,472 | 163,141 | 481,868 | -444,531,531 | -16,874,839,113 | 16,428,763,995 | 34,991,711,609 | 6,029,258,043 | 63,199,943,593 | 100 | 0 |
| CM+TH | 263,659 | 157,775 | 367,460 | -1,784,964,514 | -18,284,554,153 | 14,973,564,519 | 28,150,817,299 | 2,800,335,538 | 51,596,173,743 | 100 | 0 |
| CM+HS+TH | 445,498 | 234,614 | 712,939 | 1,536,819,184 | -16,544,745,728 | 18,963,740,808 | 43,012,997,018 | 7,084,388,044 | 84,989,288,430 | 100 | 0 |
| ED+TH | 223,868 | 113,811 | 330,815 | -2,294,749,730 | -19,739,954,330 | 14,443,228,144 | 24,681,577,973 | -1,248,809,372 | 51,422,143,805 | 99.9 | 0 |
| HS+ED | 196,491 | 76,893 | 317,371 | 3,524,644,759 | -14,137,903,456 | 20,173,433,050 | 16,124,437,516 | -9,706,729,732 | 44,384,502,670 | 95.7 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HS+ED+TH | 354,448 | 168,276 | 537,676 | 1,511,296,815 | -16,417,079,089 | 18,246,190,276 | 33,933,501,702 | 1,605,477,058 | 64,402,783,604 | 100 | 0 |
| P+HS | 91,547 | -20,703 | 232,696 | 6,517,331,770 | -10,804,768,626 | 23,782,923,830 | 2,637,363,356 | -22,055,968,966 | 31,140,464,545 | 60.8 | 0 |
| P+HS+ED | 200,657 | 29,653 | 402,635 | 5,538,460,605 | -11,677,717,081 | 22,614,362,366 | 14,527,256,127 | -14,842,172,149 | 48,824,311,435 | 91.5 | 0 |
| P+HS+TH | 252,316 | 87,288 | 435,798 | 4,493,569,308 | -12,671,756,530 | 21,330,180,898 | 20,738,031,395 | -8,237,036,985 | 52,044,210,008 | 98.5 | 0 |
| HS+TH | 248,605 | 135,749 | 359,812 | 2,466,323,044 | -14,743,566,046 | 19,398,974,967 | 22,394,204,841 | -3,796,740,218 | 48,442,540,471 | 99.5 | 0 |
| P+ED | 104,165 | (28,784) | 243,114 | 1,403,510,533 | -15,585,577,575 | 18,145,482,480 | 9,013,002,384 | -16,030,593,426 | 36,060,900,489 | 83.2 | 0 |
| P+ED+TH | 225,677 | 65,081 | 365,825 | -251,571,627 | -17,398,157,401 | 16,560,784,527 | 22,819,230,780 | -3,753,327,563 | 48,449,766,233 | 99.6 | 0 |
| P+HS+ED+TH | 357,994 | 123,872 | 590,498 | 3,544,284,926 | -13,964,288,102 | 20,389,190,002 | 32,255,120,508 | -1,042,878,605 | 68,340,714,363 | 99.9 | 0 |
| P+TH | 132,903 | 31,289 | 237,080 | 577,384,580 | -15,983,542,354 | 17,304,117,326 | 12,712,934,366 | -9,291,865,263 | 37,746,758,971 | 92.6 | 0 |
| All interventions | 545,504 | 225,776 | 889,505 | 2,718,849,098 | -15,068,315,618 | 20,464,128,481 | 51,831,538,684 | 12,703,867,597 | 96,095,729,366 | 100 | 33.6 |

*Net monetary benefit (NMB) calculated assuming a $100,000 per QALY willingness-to-pay threshold. SQ=Status Quo; CM=Contingency Management; P=Psychotherapy; HS=Hub and Spoke; ED=Emergency Department Initiation; TH=Telehealth

**eTable 10**: Expected intervention costs, QALYs, and cost per QALY gained for each strategy; healthcare perspective only, 10% coverage

| Strategy* | Total QALYs | QALYs Gained Compared to SQ | Total Cost (2021 USD) | Incremental Cost Compared to SQ (2021 USD) | ICER** (2021 USD per QALY gained) |
|---|---|---|---|---|---|
| ED | 236,022,155 | 89,696 | 1,022,377,232,892 | -5,136,093 | ND |
| SQ | 235,932,459 | 0 | 1,022,382,368,985 | 0 | D |
| ED+TH | 236,142,017 | 209,558 | 1,022,404,071,916 | 21,702,931 | 224 |
| TH | 236,059,326 | 126,866 | 1,022,415,609,629 | 33,240,644 | D |
| CM+ED+TH | 236,273,859 | 341,400 | 1,024,026,594,681 | 1,644,225,696 | 12,307 |
| CM+TH | 236,202,407 | 269,948 | 1,024,044,899,592 | 1,662,530,607 | D |
| CM+ED | 236,193,233 | 260,774 | 1,024,051,305,445 | 1,668,936,460 | D |
| CM | 236,114,587 | 182,127 | 1,024,064,101,085 | 1,681,732,100 | D |
| P+ED | 236,026,188 | 93,729 | 1,024,455,911,070 | 2,073,542,085 | D |
| P | 235,936,697 | 4,238 | 1,024,457,557,943 | 2,075,188,958 | D |
| P+ED+TH | 236,145,176 | 212,716 | 1,024,492,532,320 | 2,110,163,335 | D |
| P+TH | 236,062,803 | 130,344 | 1,024,501,348,645 | 2,118,979,660 | D |
| CM+P+ED+TH | 236,275,967 | 343,508 | 1,026,127,481,768 | 3,745,112,783 | Ex.D |
| CM+P+TH | 236,204,714 | 272,254 | 1,026,143,374,523 | 3,761,005,538 | D |
| CM+P+ED | 236,196,230 | 263,770 | 1,026,144,701,581 | 3,762,332,596 | D |
| CM+P | 236,117,644 | 185,185 | 1,026,154,365,196 | 3,771,996,211 | D |
| HS+ED | 236,104,850 | 172,391 | 1,027,491,836,190 | 5,109,467,205 | D |
| HS | 236,008,921 | 76,461 | 1,027,492,009,483 | 5,109,640,498 | D |
| HS+ED+TH | 236,253,752 | 321,292 | 1,027,540,906,227 | 5,158,537,242 | D |
| HS+TH | 236,160,985 | 228,526 | 1,027,545,554,258 | 5,163,185,273 | D |
| CM+HS+ED | 236,326,072 | 393,612 | 1,029,207,007,189 | 6,824,638,204 | Ex.D |
| CM+HS+ED+TH | 236,449,504 | 517,045 | 1,029,210,615,443 | 6,828,246,458 | 29,514 |
| CM+HS | 236,235,107 | 302,647 | 1,029,211,383,949 | 6,829,014,964 | D |
| CM+HS+TH | 236,364,392 | 431,933 | 1,029,220,325,882 | 6,837,956,897 | D |
| P+HS | 236,013,964 | 81,505 | 1,029,571,604,283 | 7,189,235,298 | D |
| P+HS+ED | 236,109,514 | 177,055 | 1,029,575,006,982 | 7,192,637,997 | D |
| P+HS+ED+TH | 236,258,317 | 325,857 | 1,029,635,201,675 | 7,252,832,690 | D |
| P+HS+TH | 236,165,576 | 233,116 | 1,029,636,609,315 | 7,254,240,330 | D |
| CM+P+HS+ED | 236,330,136 | 397,676 | 1,031,307,462,643 | 8,925,093,658 | D |
| CM+P+HS | 236,239,448 | 306,988 | 1,031,308,497,584 | 8,926,128,599 | D |
| CM+P+HS+ED+TH | 236,453,017 | 520,557 | 1,031,320,804,786 | 8,938,435,801 | 600,737 |
| CM+P+HS+TH | 236,368,316 | 435,857 | 1,031,327,616,052 | 8,945,247,067 | D |

*ND=Not dominated; Ex.D=Dominated by extension; D=Dominated; Strategies that are dominated are more costly and less effective than not dominated strategies. Strategies that are dominated by extension are more costly and less effective than the linear scale-up not dominated strategies. SQ=Status Quo; CM=Contingency Management; P=Psychotherapy; HS=Hub and Spoke; ED=Emergency Department Initiation; TH=Telehealth

**eTable 11**: Expected overdose deaths for each strategy, with varying coverage interventions

| | Overdose Deaths Averted Compared to SQ | | |
|---|---|---|---|
| **Strategy*** | **5% Coverage** | **10% Coverage*** | **20% Coverage** |
| SQ | 0 | 0 | 0 |
| CM | 1,870 | 3,530 | 6,230 |
| P | 40 | 80 | 160 |
| HS | 520 | 940 | 1,560 |
| ED | 560 | 1,110 | 2,180 |
| TH | 1,250 | 2,420 | 4,460 |
| CM+P | 1,910 | 3,590 | 6,320 |
| CM+HS | 2,530 | 5,050 | 10,010 |
| P+HS | 560 | 1,030 | 1,750 |
| CM+P+HS | 2,570 | 5,130 | 10,170 |
| CM+ED | 2,400 | 4,500 | 7,840 |
| HS+ED | 1,100 | 2,130 | 4,000 |
| P+ED | 600 | 1,190 | 2,340 |
| CM+P+ED | 2,440 | 4,560 | 7,930 |
| CM+HS+ED | 3,100 | 6,170 | 12,260 |
| P+HS+ED | 1,140 | 2,210 | 4,190 |
| CM+P+HS+ED | 3,140 | 6,250 | 12,410 |
| CM+TH | 2,990 | 5,390 | 8,690 |
| P+TH | 1,290 | 2,490 | 4,580 |
| HS+TH | 1,860 | 3,690 | 7,280 |
| ED+TH | 1,790 | 3,440 | 6,270 |
| CM+P+TH | 3,020 | 5,440 | 8,750 |
| CM+HS+TH | 3,780 | 7,460 | 14,620 |
| P+HS+TH | 1,900 | 3,780 | 7,450 |
| CM+ED+TH | 3,490 | 6,260 | 9,950 |
| HS+ED+TH | 2,430 | 4,840 | 9,610 |
| P+ED+TH | 1,830 | 3,510 | 6,380 |
| CM+P+ED+TH | 3,520 | 6,320 | 10,000 |
| CM+HS+ED+TH | 4,320 | 8,500 | 16,510 |
| P+HS+ED+TH | 2,470 | 4,920 | 9,780 |
| CM+P+HS+TH | 3,820 | 7,530 | 14,740 |
| All interventions | 4,360 | 8,570 | 16,620 |

SQ=Status Quo; CM=Contingency Management; P=Psychotherapy; HS=Hub and Spoke; ED=Emergency Department Initiation; TH=Telehealth

**eTable 12**: Expected intervention costs, QALYs, and cost per QALY gained for each strategy; 5% coverage of all interventions

| Strategy* | Total QALYs | QALYs Gained Compared to SQ | Total Cost (2021 USD) | Incremental Cost Compared to SQ (2021 USD) | ICER** (2021 USD per QALY gained) |
|---|---|---|---|---|---|
| CM+ED+TH | 236,128,545 | 196,086 | 1,569,854,672,955 | -1,633,812,509 | ND |
| CM+TH | 236,087,750 | 155,290 | 1,570,217,085,884 | -1,271,399,581 | D |
| ED+TH | 236,042,601 | 110,141 | 1,570,220,252,279 | -1,268,233,186 | D |
| TH | 235,998,853 | 66,394 | 1,570,613,810,063 | -874,675,402 | D |
| CM+ED | 236,073,910 | 141,450 | 1,570,614,390,413 | -874,095,051 | D |
| CM+P+ED+TH | 236,129,931 | 197,471 | 1,570,877,812,413 | -610,673,052 | Ex.D |
| CM | 236,031,265 | 98,806 | 1,570,999,301,059 | -489,184,406 | D |
| ED | 235,977,620 | 45,161 | 1,571,081,622,935 | -406,862,530 | D |
| P+ED+TH | 236,044,384 | 111,925 | 1,571,233,171,153 | -255,314,312 | D |
| CM+P+TH | 236,089,522 | 157,062 | 1,571,239,740,418 | -248,745,047 | D |
| SQ | 235,932,459 | 0 | 1,571,488,485,465 | 0 | D |
| P+TH | 236,000,822 | 68,362 | 1,571,625,803,511 | 137,318,046 | D |
| CM+P+ED | 236,075,945 | 143,486 | 1,571,628,821,067 | 140,335,603 | D |
| CM+HS+ED+TH | 236,194,741 | 262,282 | 1,571,693,318,212 | 204,832,747 | 27,776 |
| CM+P | 236,033,139 | 100,680 | 1,572,012,547,399 | 524,061,934 | D |
| CM+HS+TH | 236,150,589 | 218,129 | 1,572,087,990,541 | 599,505,076 | D |
| P+ED | 235,979,629 | 47,170 | 1,572,091,228,311 | 602,742,846 | D |
| HS+ED+TH | 236,093,307 | 160,848 | 1,572,204,080,747 | 715,595,282 | D |
| P | 235,934,493 | 2,033 | 1,572,497,078,734 | 1,008,593,270 | D |
| CM+HS+ED | 236,129,293 | 196,833 | 1,572,554,958,131 | 1,066,472,666 | D |
| HS+TH | 236,047,411 | 114,951 | 1,572,618,452,932 | 1,129,967,467 | D |
| All interventions | 236,196,651 | 264,192 | 1,572,711,526,376 | 1,223,040,911 | 533,126 |
| CM+HS | 236,083,936 | 151,477 | 1,572,968,225,503 | 1,479,740,039 | D |
| CM+P+HS+TH | 236,152,662 | 220,202 | 1,573,104,987,186 | 1,616,501,721 | D |
| HS+ED | 236,021,211 | 88,751 | 1,573,133,993,087 | 1,645,507,622 | D |
| P+HS+ED+TH | 236,095,644 | 163,185 | 1,573,217,472,184 | 1,728,986,719 | D |
| HS | 235,974,526 | 42,066 | 1,573,554,435,505 | 2,065,950,040 | D |
| CM+P+HS+ED | 236,131,301 | 198,842 | 1,573,570,360,353 | 2,081,874,888 | D |
| P+HS+TH | 236,049,621 | 117,162 | 1,573,631,025,479 | 2,142,540,014 | D |
| CM+P+HS | 236,086,127 | 153,667 | 1,573,982,772,379 | 2,494,286,914 | D |
| P+HS+ED | 236,023,461 | 91,002 | 1,574,144,342,820 | 2,655,857,355 | D |
| P+HS | 235,976,838 | 44,379 | 1,574,564,312,021 | 3,075,826,556 | D |

*ND=Not dominated; Ex.D=Dominated by extension; D=Dominated; Strategies that are dominated are more costly and less effective than not dominated strategies. Strategies that are dominated by extension are more costly and less effective than the linear scale-up not dominated strategies. SQ=Status Quo; CM=Contingency Management; P=Psychotherapy; HS=Hub and Spoke; ED=Emergency Department Initiation; TH=Telehealth

**eTable 13**: Expected intervention costs, QALYs, and cost per QALY gained for each strategy; 20% coverage of all interventions

| Strategy* | Total QALYs | QALYs Gained Compared to SQ | Total Cost (2021 USD) | Incremental Cost Compared to SQ (2021 USD) | ICER** (2021 USD per QALY gained) |
|---|---|---|---|---|---|
| ED+TH | 236,307,321 | 374,862 | 1,567,026,839,182 | -4,461,646,283 | ND |
| CM+ED+TH | 236,431,297 | 498,837 | 1,567,624,643,977 | -3,863,841,488 | 4,822 |
| TH | 236,159,469 | 227,009 | 1,568,356,442,768 | -3,132,042,697 | D |
| CM+TH | 236,326,069 | 393,609 | 1,568,575,585,595 | -2,912,899,870 | D |
| CM+ED | 236,371,400 | 438,941 | 1,569,220,083,264 | -2,268,402,201 | D |
| ED | 236,109,274 | 176,815 | 1,569,901,069,570 | -1,587,415,895 | D |
| CM | 236,238,794 | 306,334 | 1,570,398,972,352 | -1,089,513,113 | D |
| P+ED+TH | 236,311,909 | 379,450 | 1,571,150,190,908 | -338,294,557 | D |
| SQ | 235,932,459 | 0 | 1,571,488,485,465 | 0 | D |
| CM+P+ED+TH | 236,431,835 | 499,376 | 1,571,819,421,686 | 330,936,221 | Ex.D |
| P+TH | 236,164,866 | 232,407 | 1,572,461,890,461 | 973,404,996 | D |
| CM+P+TH | 236,327,581 | 395,122 | 1,572,758,179,780 | 1,269,694,315 | D |
| CM+P+ED | 236,374,469 | 442,010 | 1,573,372,147,833 | 1,883,662,368 | D |
| CM+HS+ED+TH | 236,941,461 | 1,009,002 | 1,573,507,503,982 | 2,019,018,517 | 11,531 |
| P+ED | 236,117,297 | 184,837 | 1,573,951,938,634 | 2,463,453,169 | D |
| CM+P | 236,242,631 | 310,171 | 1,574,541,542,756 | 3,053,057,291 | D |
| CM+HS+TH | 236,786,247 | 853,788 | 1,574,909,646,168 | 3,421,160,703 | D |
| HS+ED+TH | 236,572,427 | 639,968 | 1,575,194,961,321 | 3,706,475,856 | D |
| P | 235,940,957 | 8,497 | 1,575,524,530,836 | 4,036,045,371 | D |
| CM+HS+ED | 236,718,648 | 786,189 | 1,576,632,422,842 | 5,143,937,377 | D |
| HS+TH | 236,383,451 | 450,991 | 1,576,897,067,370 | 5,408,581,905 | D |
| CM+P+HS+ED+TH | 236,946,595 | 1,014,135 | 1,577,713,054,070 | 6,224,568,605 | 819,183 |
| CM+HS | 236,536,041 | 603,581 | 1,578,274,709,799 | 6,786,224,334 | D |
| CM+P+HS+TH | 236,792,952 | 860,492 | 1,579,096,768,934 | 7,608,283,469 | D |
| HS+ED | 236,257,514 | 325,055 | 1,579,176,938,229 | 7,688,452,764 | D |
| P+HS+ED+TH | 236,581,847 | 649,388 | 1,579,301,634,077 | 7,813,148,612 | D |
| CM+P+HS+ED | 236,727,213 | 794,754 | 1,580,775,416,028 | 9,286,930,563 | D |
| HS | 236,060,309 | 127,850 | 1,580,953,895,363 | 9,465,409,898 | D |
| P+HS+TH | 236,393,207 | 460,748 | 1,580,988,020,309 | 9,499,534,844 | D |
| CM+P+HS | 236,544,919 | 612,460 | 1,582,397,278,241 | 10,908,792,776 | D |
| P+HS+ED | 236,267,909 | 335,450 | 1,583,219,048,683 | 11,730,563,218 | D |
| P+HS | 236,071,128 | 138,669 | 1,584,980,289,212 | 13,491,803,747 | D |

*ND=Not dominated; Ex.D=Dominated by extension; D=Dominated; Strategies that are dominated are more costly and less effective than not dominated strategies. Strategies that are dominated by extension are more costly and less effective than the linear scale-up not dominated strategies. SQ=Status Quo; CM=Contingency Management; P=Psychotherapy; HS=Hub and Spoke; ED=Emergency Department Initiation; TH=Telehealth

**eTable 14**: Quality-adjusted life years for each health state in SOURCE

| Health Stock | QALY Value | QALY Range | Source |
|---|---|---|---|
| Non-disordered heroin use | 0.574 | (0.538-0.611) | (70) |
| Rx misuse no heroin use in the past year | 0.694 | (0.660,0.727) | (70) |
| Rx OUD no heroin use in the past year no MOUD | 0.626 | (0.591-0.661) | (70) |
| Rx OUD with heroin use in the past year no MOUD | 0.569 | - | Calculated |
| HUD no MOUD | 0.512 | (0.475-0.549) | (70) |
| Rx OUD no heroin in buprenorphine treatment | 0.766 | (0.7395-0.7925) | (70) |
| Rx OUD no heroin in methadone treatment | 0.766 | (0.7395-0.7925) | (70) |
| Rx OUD no heroin in Vivitrol treatment | 0.766 | (0.7395-0.7925) | (70) |
| Rx OUD with heroin in buprenorphine treatment | 0.766 | (0.7395-0.7925) | (70) |
| Rx OUD with heroin in methadone treatment | 0.766 | (0.7395-0.7925) | (70) |
| Rx OUD with heroin in Vivitrol treatment | 0.766 | (0.7395-0.7925) | (70) |
| HUD in buprenorphine treatment | 0.766 | (0.7395-0.7925) | (70) |
| HUD in methadone treatment | 0.766 | (0.7395-0.7925) | (70) |
| HUD in Vivitrol treatment | 0.766 | (0.7395-0.7925) | (70) |
| Rx OUD no heroin in remission | 0.807 | (0.78-0.834) | (70) |
| Rx OUD no heroin in stable remission | 0.807 | (0.78-0.834) | (70) |
| Rx OUD with heroin in remission | 0.807 | (0.78-0.834) | (70) |
| Rx OUD with heroin in stable remission | 0.807 | (0.78-0.834) | (70) |
| HUD in remission | 0.807 | (0.78-0.834) | (70) |
| HUD in stable remission | 0.807 | (0.78-0.834) | (70) |

MOUD=Medication for opioid use disorder; OUD=Opioid use disorder; Rx OUD=Opioid use disorder involving prescription opioids; HUD=Heroin-use disorder; Opioid use disorder involving heroin

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